

Increasing Pneumococcal Vaccination in Managed Care Through Telephone Outreach

Carla A. Winston, MA, PhD; Adrienne D. Mims, MD, MPH; and Kecia A. Leatherwood, MS

Pneumococcal vaccination is recommended for all persons 65 years and older and for younger persons with chronic medical conditions such as immunodeficiency or heart, lung, liver, or kidney disease.¹ Among persons 65 years and older, marked differences in vaccination exist by race/ethnicity. According to 2001 National Health Interview Survey data for persons 65 years and older, 57% of non-Hispanic white subjects compared with 31% of non-Hispanic black subjects have ever received pneumococcal vaccine.² Although the racial/ethnic gap in younger persons is less marked, vaccination rates among high-risk patients aged 18 to 64 years are low, with an estimated pneumococcal vaccination coverage of 19% in 2002.^{3,4}

Managed care has been associated with decreased racial/ethnic disparities in immunization coverage compared with fee-for-service insurance; however, racial disparities in coverage persist in managed care.⁵ Little is known about why disparities exist in managed care populations with presumably equal access to medical care. In addition, little is known about the effectiveness of outreach or reminder and recall strategies among minority populations. Reminder and recall by telephone or mail has been shown to work in several settings and is strongly recommended by the Task Force on Community Preventive Services.^{6,7} However, few studies⁸⁻¹¹ include minority high-risk populations, which may be the hardest populations to reach in terms of improving adult vaccination. We conducted a randomized trial to determine the effectiveness of telephone outreach to increase pneumococcal vaccination in a managed care population that had already received exposure to preventive services reminders and to determine whether the intervention effect is similar for clinics serving primarily non-Hispanic black or non-Hispanic white patient populations.

METHODS

Study Population

The study population consisted of all patients at 5 managed care network general medicine clinics in Atlanta, Ga, who were (1) 18 years or older with a chronic medical condition (chronic disease group) or 65 years or older without a chronic medical condition (elderly group), and (2) unvaccinated according to the administrative

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Objectives: To determine the effectiveness of a telephone reminder to increase pneumococcal vaccination in a population that had received mailed reminders and to evaluate whether the intervention effect is similar for clinics serving primarily non-Hispanic black or non-Hispanic white patient populations.

Study Design: Randomized trial within a managed care network.

Methods: All unvaccinated patients 18 years and older with chronic medical conditions and 65 years and older without chronic medical conditions (N = 6106) were randomized to receive telephone intervention or standard care and followed up for 6-month vaccination status. The intervention was a telephone call initiated by a nurse to inform patients that pneumococcal vaccination was recommended and was a covered benefit of their insurance.

Results: Intervention patients were 2.3 times as likely to be vaccinated during the study period than control patients ($P < .001$). The success of telephone intervention versus control was similar across clinics ($P = .16$) and across the chronic disease and elderly groups ($P = .14$). In subanalyses of individuals reached by telephone intervention, unvaccinated black subjects were less likely to be vaccinated during the study than unvaccinated white subjects (34% vs 25%, $P = .03$). Nurse staff time for telephone intervention cost \$147.35 per additional patient vaccinated.

Conclusions: Telephone intervention was successful at increasing vaccination rates in a diverse managed care population that had already received mailed reminders. Tailored messaging for pneumococcal vaccination through telephone reminders increases patient demand for vaccination and should be implemented by managed care organizations seeking to increase their vaccination rates.

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For author information and disclosures, see end of text.

database. All patients had received letters in the spring of 2004 as part of a routine quality improvement project for pneumococcal vaccination. The reminder letters encouraged patients to schedule a clinic visit for pneumococcal vaccination or to respond by enclosed postcard if they had previously been vaccinated elsewhere.

Inclusion and Exclusion Criteria

Patients were identified as unvaccinated based on the pneumococcal vaccination field in the administrative database. Elderly patients were identified as eligible based on their date of birth and participation in Medicare managed care insurance. Chronic disease patients 18 years and older were identified as eligible if they had diabetes mellitus, chronic heart failure, or coronary artery disease documented in the database. Patients who were vaccinated or replied by postcard that they had been vaccinated elsewhere within 3 months after the mailed reminder were not eligible for randomization.

Randomization Strategy

Because race/ethnicity was not in the administrative database, we used clinic as a proxy for race/ethnicity. Two clinics serve predominantly (>60%) non-Hispanic black patient populations (group 1), while 3 clinics serve predominantly non-Hispanic white patient populations (group 2) according to 2003 Consumer Assessment of Health Plans patient survey data ([Appendix A](#) available at www.ajmc.com). Within each of the 5 clinics, a random number generator was used to allocate patients to intervention or control arms at a 1:1 ratio (ie, 1 control patient was assigned for each intervention patient). Randomization was completed and patients accrued into each arm before the intervention began. The study was blinded; randomization assignment was not known to the patient's primary care physician or home medical office.

Intervention

Patients in the intervention arm were sent an advance letter with electronic signature stamp of their primary care physician. The letter provided contact information for the study and stated that a nurse would call them in the next few weeks. Patients could opt out of the study by calling the study coordinator. Control patients received no additional outreach beyond exposure to preventive services reminders posted in all medical offices and mailed reminders sent to intervention and control patients in the spring of 2004. The telephone intervention was conducted first among chronic disease patients randomized in June 2004 and then among elderly patients randomized in July 2004. Mailed reminders had similarly been sent to the 2 groups in March and April 2004. The study pro-

ocol was approved by the institutional review boards of Kaiser Permanente and the Centers for Disease Control and Prevention. Patient data were identified only by unique study number in the analytic data set.

Reminder Telephone Calls

Nurses were trained in pneumococcal vaccine indications, contraindications, and a standardized data collection instrument for the study. During the intervention telephone call, nurses explained the study and asked permission from each patient to speak briefly about pneumococcal vaccination. At least 4 attempts were made to contact all patients randomized to intervention. Patients were asked, "Have you ever had a pneumonia shot?" If unvaccinated, patients were asked, "What would you say is the main reason you have not had a pneumonia shot?" Nurses explained that pneumococcal vaccination is recommended and that vaccination is a covered benefit of their managed care insurance with no required copayment. Unvaccinated patients were asked if they would like to receive the pneumococcal vaccine and could schedule a clinic visit for vaccination during the same telephone call.

Data Analysis

Outcome Measures. The primary outcome for intent-to-treat analyses for all patients was 6-month follow-up for pneumococcal vaccination *Current Procedural Technology* code 90732 in the administrative database. Secondary outcomes were the proportion and characteristics of patients in the intervention arm who reported by telephone that they were already vaccinated, primary reason for nonvaccination, and vaccination interest and uptake among intervention arm patients reached by telephone who confirmed that they had not been previously vaccinated.

Predictor Variables. Variables of interest included randomization to intervention or control, age, length of health maintenance organization (HMO) managed care enrollment, sex, and clinic group. Patients who received telephone intervention were asked to self-report their race/ethnicity, as well as educational level.

Analyses. Analyses were performed using techniques for longitudinal cohort data. We tested categorical differences between groups using χ^2 tests for proportions. Continuous data were compared using *t* tests for means. Analyses were conducted using commercially available statistical software (SAS version 9.1; SAS Institute, Inc, Research Triangle Park, NC). Kaplan-Meier estimates were calculated to compare intervention and control arms. We used Cox proportional hazards regression analysis to assess multivariate associations between vaccination and randomization arm, age, length of

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HMO enrollment, sex, and clinic group as a proxy for race/ethnicity. Direct measures of race/ethnicity and educational level were not included in modeling because these data were not in the administrative database and were only available for intervention patients who answered the telephone survey. Statistical significance was established as $P \leq .05$, with interaction considered significant at $P \leq .10$. We calculated the cost of nurse staff time for the study as the hourly nursing wage times the number of nurse hours spent on study training and intervention.

RESULTS

The **Table** gives characteristics of intervention and control patients, with only minor differences between the 2 groups. **Figure 1** shows overall study enrollment and randomization flow with vaccination outcomes. Elderly patients (71% [850/1198]) were more likely to be reached for intervention calls than chronic disease patients (57% [1043/1845]). There were low rates of refusal to participate. Fewer than 1% were deceased, 5% had moved or had disconnected telephone numbers, and 2% were no longer managed care members.

Vaccination Status 6 Months After Randomization in the Intent-to-treat Analyses

In the chronic disease group, 16% (288/1845) of intervention patients were vaccinated compared with 6% (111/1866) of controls ($P < .001$). In the elderly group, 17% (201/1198) of intervention patients were vaccinated versus 8% (100/1197)

of controls ($P < .001$). **Figure 2** shows Kaplan-Meier estimates of time from randomization to vaccination for the intervention arm versus the control arm in group 1 (predominantly non-Hispanic black) versus group 2 (predominantly non-Hispanic white) clinics for chronic disease and elderly patients. Most uptake for the intervention arm occurred within 1 month after initiation of telephone calls, while for the control arm it began in October, coinciding with the influenza vaccination season. Among the chronic disease and elderly groups combined, patients in the intervention arm were 2.3 (95% confidence interval, 2.0-2.7) times as likely to be vaccinated during the 6-month study period than patients in the control arm ($P < .001$); the intervention effect was unchanged after multivariate adjustment for age, sex, length of HMO enrollment, and clinic group. In Cox proportional hazards regression modeling to assess interaction, the effect of telephone intervention vs control was similar across clinics ($P = .16$) and chronic disease and elderly risk strata ($P = .14$).

Telephone Intervention Subanalyses

Results by race/ethnicity and educational level were limited to intervention patients reached by telephone because race/ethnicity and educational level were not in the administrative database. Analyses were restricted to non-Hispanic black subjects and non-Hispanic white subjects because other categories were too small for meaningful analysis. Patients reached by telephone were statistically significantly more likely to be female (52% female in the chronic disease group and 61% female in the elderly group) and older (mean age, 55.8 vs

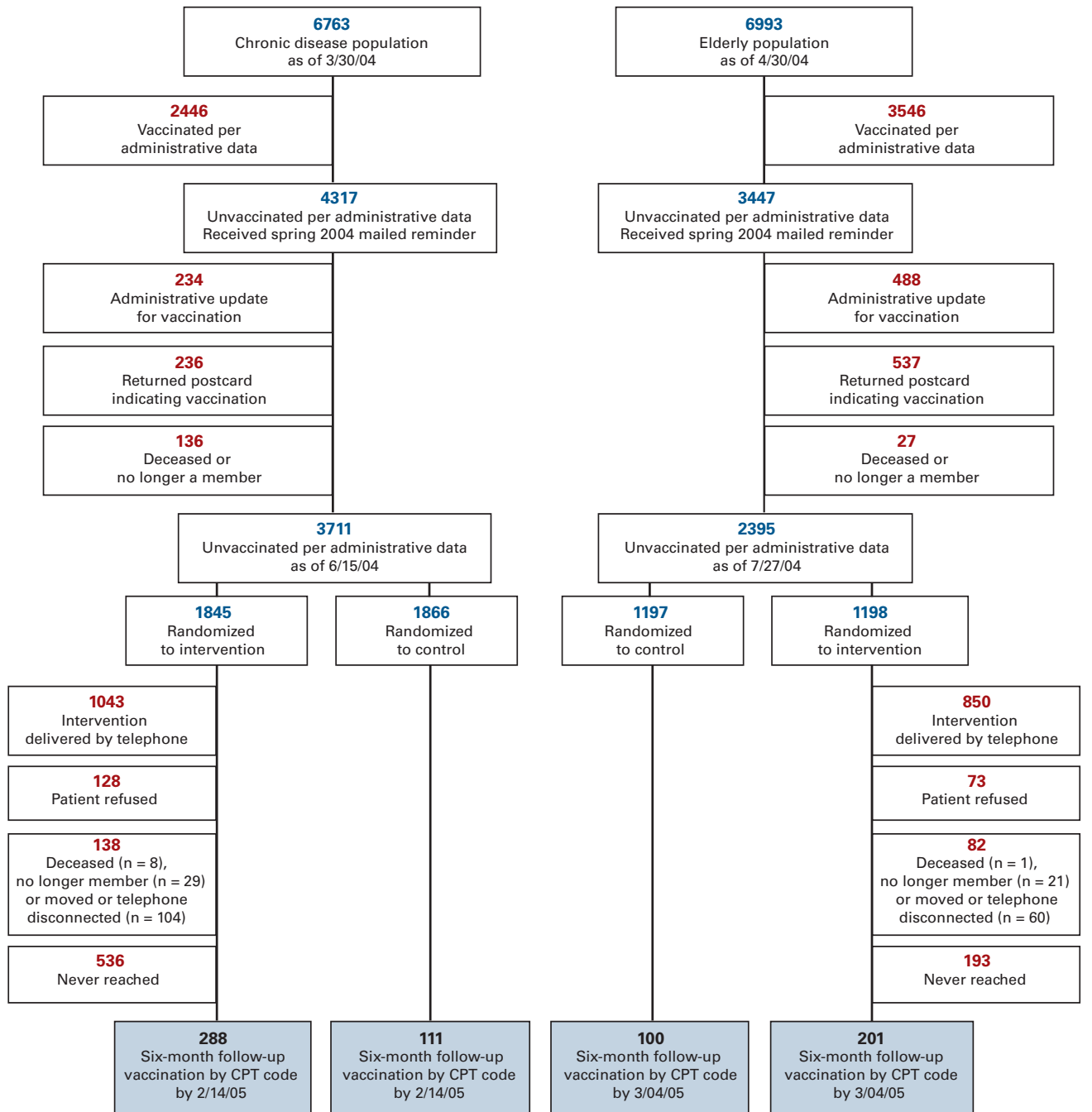
Table. Baseline Patient Characteristics by Randomization Assignment*

Characteristic	Chronic Disease Group (n = 3711)		Elderly Group (n = 2395)	
	Telephone Intervention (n = 1845)	Standard Care Control (n = 1866)	Telephone Intervention (n = 1198)	Standard Care Control (n = 1197)
Age, y	53.8 ± 0.3	53.9 ± 0.3	72.0 ± 0.2 [†]	71.4 ± 0.2
Length of health maintenance organization enrollment, y	8.1 ± 0.1	7.9 ± 0.1	5.9 ± 0.1	6.1 ± 0.1
Male sex	945 (51.2) [†]	894 (47.9)	491 (41.0)	472 (39.4)
Coronary artery disease	321 (17.4)	356 (19.1)	—	—
Congestive heart failure	210 (11.4)	219 (11.7)	—	—
Diabetes mellitus	1509 (81.8)	1484 (79.5)	—	—

*Data are given as mean ± SE or as number (percentage). Chronic disease patients were 18 years or older with coronary artery disease, chronic heart failure, or diabetes mellitus. Elderly patients were 65 years or older without chronic medical conditions.

[†]Intervention group differs from control group ($P \leq .05$).

■ **Figure 1.** Total Population Eligible for Vaccination and Vaccination Outcomes by Randomization*



*CPT indicates *Current Procedural Technology*.

51.2 years in the chronic disease group and 72.2 vs 71.5 years in the elderly group) than patients who were not reached, but length of HMO enrollment did not differ.

Among 1043 chronic disease patients reached by telephone, 234 (22%) reported that they had previously received pneumococcal vaccine. Vaccinated patients were older than

those who had never been vaccinated (mean age, 62.3 vs 53.9 years; $P < .001$) and had longer HMO enrollment (mean, 8.4 vs 7.3 years; $P = .009$). Non-Hispanic black subjects were less likely to report prior vaccination than non-Hispanic white subjects (20% vs 29%, $P = .003$). Prior vaccination did not statistically significantly differ by clinic group or sex.

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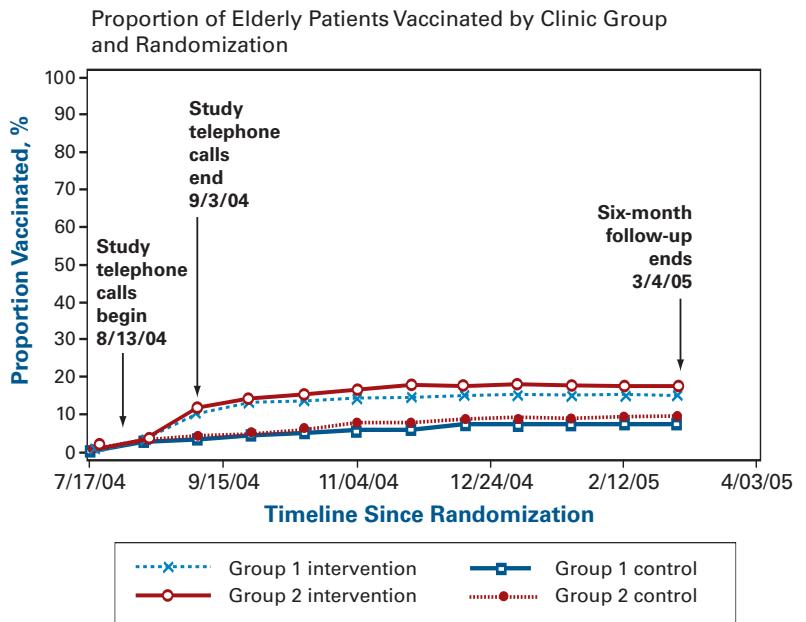
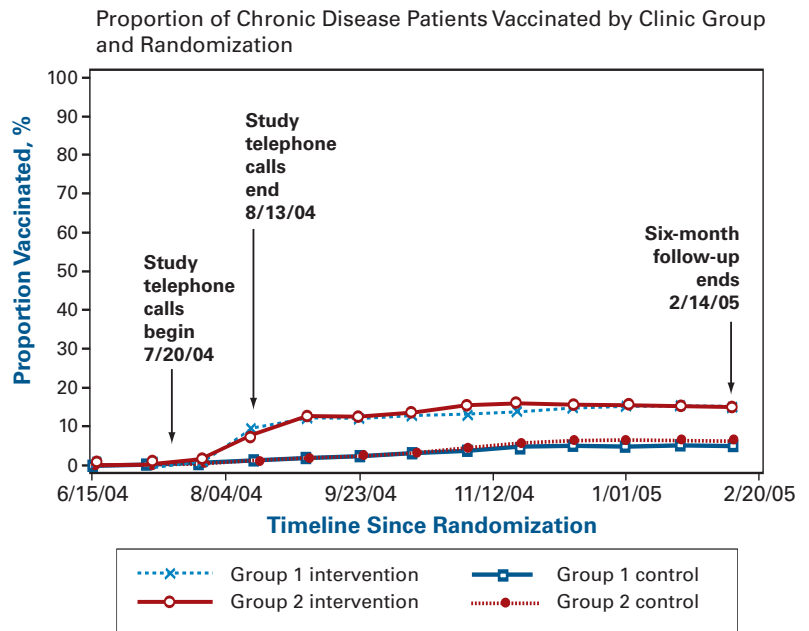
Educational level was not associated with vaccination after control of confounding by age ($P = .09$).

Among 850 elderly patients reached by telephone, 375 (44%) reported that they had previously received pneumococcal vaccine. Vaccinated patients were older than those who had never been vaccinated (mean age, 73.2 vs 71.5 years; $P < .001$), with no differences in length of HMO enrollment or sex. Non-Hispanic black subjects were statistically significantly less likely to report prior vaccination than non-Hispanic white subjects (33% vs 51%, $P < .001$). Prior vaccination differences by clinic group mirrored differences by race/ethnicity ($P < .001$). Among patients with less than high school education, 39% reported vaccination vs 41% of high school graduates and 47% of patients with more than high school education ($P = .04$).

Vaccination Interest Among Previously Unvaccinated Intervention Patients

When pneumococcal vaccine was offered to chronic disease patients reached by telephone who did not report previous vaccination, 62% of non-Hispanic white subjects stated that they would like to get the vaccine compared with 56% of non-Hispanic black subjects ($P = .15$). Non-Hispanic black and non-Hispanic white patients were equally likely to say that they were unsure whether they would like to get the vaccine (20%). Among the elderly, similar percentages of non-Hispanic white subjects and non-Hispanic black subjects stated that they would like the vaccine (63% vs 55%, $P = .10$); however, elderly non-Hispanic black subjects were more likely than elderly non-Hispanic white subjects to say that they were unsure whether they would like to get the vaccine (17% vs 9%, $P = .03$). The percentage of patients who scheduled a clinic visit during the telephone intervention was not statistically significantly different by race/ethnicity among chronic disease (47%) versus elderly (39%) patients. The primary reason for nonvaccination across age, race/ethnicity, educational level, sex, and dis-

Figure 2. Kaplan-Meier Estimates for Cumulative Proportion Vaccinated Since Randomization

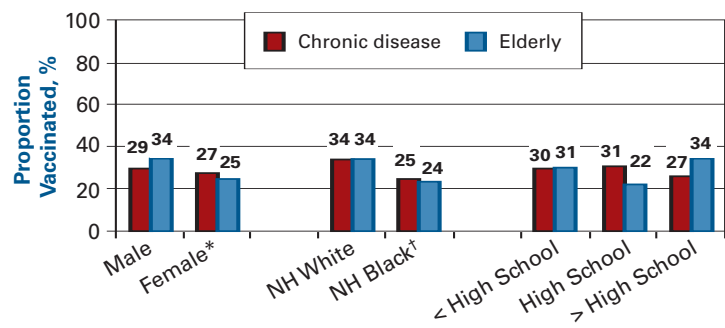


ease was not knowing that pneumococcal vaccination was needed.

Vaccination Uptake Among Previously Unvaccinated Intervention Patients

Figure 3 shows vaccination uptake among intervention arm patients reached by telephone who stated that they

■ **Figure 3.** Six-month Vaccination Uptake Among Previously Unvaccinated Intervention Patients Reached by Telephone



*Among the elderly, men were more likely to be vaccinated during the study period than women ($P = .05$).

†Among both chronic disease and elderly patients, non-Hispanic blacks were less likely to be vaccinated during the study period than non-Hispanic whites ($P = .03$). NH indicates non-Hispanic.

had never been vaccinated. Among 809 chronic disease patients reached by telephone who confirmed that they were previously unvaccinated, 225 (28%) were vaccinated within 6 months of telephone contact, as were 134 (28%) of 475 elderly patients. Non-Hispanic black subjects were statistically significantly less likely to be vaccinated during the study period than non-Hispanic white subjects among chronic disease (25% vs 34%) and elderly (24% vs 34%) patients ($P = .03$ for both). Men were slightly more likely to be vaccinated than women among the elderly (34% vs 25%, $P = .05$).

Costs of the Intervention

Nurse staff time for the telephone calls, including training, cost \$41 520.50. Among the intervention group, 278 additional patients were vaccinated above expectation based on the vaccination rate among controls, for a mean nurse time cost of \$147.35 per additional member vaccinated.

DISCUSSION

Randomized telephone intervention led to a greater than 2-fold increase in pneumococcal vaccination within 6 months compared with standard care in a diverse managed care population. Although HMO patients had previously been exposed to mailed reminders and prevention posters in examination rooms and triage stations, a telephone reminder from trained nurses successfully increased vaccination. Given that a substantial proportion of intervention patients were never reached by telephone and that some persons initially identified as unvaccinated reported previous vaccination when reached by telephone, the proportion vaccinated following

telephone calls was actually higher than that reported in the intent-to-treat analysis.

Lack of awareness of pneumococcal vaccine is the most frequently cited reason for pneumococcal nonvaccination.¹² However, the fact that patients generally stated that they did not know they needed vaccination was surprising because HMO patients receive routine reminders by mail. One advantage of the nurse telephone calls over mailed reminders is the interaction between patient and nurse; patients may better understand the vaccine recommendation as explained to them during a telephone call compared with during a busy clinic visit, when competing priorities must be attended to. Similarly, automated telephone messages may be less effective than live callers for health promotion,¹³ as they offer limited opportunities for interaction. Intervention patients who received the vaccine generally did so within a few months after telephone contact, with an increase in vaccination immediately after telephone calls began.

One of the study goals was to determine if the effect of telephone intervention was similar for non-Hispanic black (group 1) and non-Hispanic white (group 2) patient populations. In intent-to-treat analyses, intervention success was similar for group 1 and group 2 clinics. Clinic served as a proxy for race/ethnicity based on known composition of clinic patient populations because race/ethnicity was not available in patient electronic records. Self-reported race/ethnicity among patients reached by telephone closely mirrored the Consumer Assessment of Health Plans data used to designate clinics as predominantly white or predominantly black. This analysis demonstrates the effectiveness of telephone intervention across different clinics and different background vaccination rates within the managed care setting among a population that had already been exposed to preventive services reminders.

A limitation of this analysis is that person-level data on race/ethnicity are available only for the subsample of patients reached by telephone. In addition, the analysis by race with the exclusion of Hispanic subjects did not allow us to examine the effect of ethnicity or country of origin. As in other studies,^{2,14-16} we found that non-Hispanic black subjects were less likely than non-Hispanic white subjects to report previous vaccination. They were also less likely to express interest in vaccination (although the difference was not statistically significant) and less likely to present for vaccination after the telephone intervention. These data suggest potential differences in the perceived importance of vaccination and in care-seeking behavior.^{17,18} A recent study¹⁹ of pneumococcal vaccine acceptance when offered by a nurse immediately before a physician

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visit showed slightly lower acceptance among black subjects than white subjects. These findings may help to explain some of the baseline differences in vaccination rates across clinics and should encourage managed care administrators and policy makers to focus future interventions on clinics and populations with the lowest baseline vaccination. Because this intervention did not focus on eliminating disparities, clinics with low baseline rates still had lower final rates than clinics with high baseline rates as a result of equivalent intervention success ([Appendix B](#) available at www.ajmc.com).

A more general limitation is that the inclusion of previously vaccinated persons mitigated the intervention effect. A large proportion of intervention patients, particularly in the elderly group, reported that they had been previously vaccinated, which was not noted in their records (details available in an appendix from the author). Self-report of pneumococcal vaccination has been shown to be moderately sensitive and specific in comparison with medical records and claims data.^{20,21} However, the lack of corresponding self-report data for the control arm precludes making direct comparisons. We used *Current Procedural Technology* code for vaccination as the outcome because self-report would clearly be biased in favor of intervention patients reached by telephone. Patients who reported prior vaccination by telephone may reduce future intervention costs if the intervention database is used to update electronic records to indicate that patients reporting prior vaccination do not need to be targeted for future vaccination interventions.

CONCLUSIONS

In summary, immunization programs in managed care environments can enhance their vaccination rates by using various low-cost (mailed reminders and combined campaigns for influenza and pneumococcal vaccination) and higher-cost (telephone reminders) patient intervention strategies. Although no cost-effectiveness analysis was conducted, we found that telephone outreach calls are inexpensive for the potential benefit to patients and are successful at raising vaccination rates. Findings from prior studies^{22,23} indicate that pneumococcal vaccination is cost saving for elderly and high-risk patients, and our marginal cost per additional patient vaccinated compares favorably with that of other telephone reminders.²⁴ The nurse training conducted as part of this study may serve as provider education, leading nurses to recommend vaccination more frequently outside of the study setting.⁹

Take-away Points

This randomized trial demonstrates the effectiveness of a telephone intervention for increasing adult pneumococcal vaccination rates among high-risk patients across racially/ethnically diverse managed care clinics.

- Not knowing that pneumococcal vaccination is needed is common among high-risk patients, despite their exposure to routine preventive services reminders.
- Telephone outreach increases adult vaccination in diverse managed care settings across a broad spectrum of age and comorbid conditions.
- Telephone calls are inexpensive for the potential benefit provided.
- Increased data capture regarding prior immunizations can improve the targeting of patients and lower the cost of outreach programs.

Improved data regarding patient self-report of prior vaccination may also improve targeting of reminders and may lower the cost of future outreach programs. Despite being effective, telephone reminder programs may be insufficient to eliminate racial/ethnic disparities if baseline disparities already exist and if disparities are not specifically targeted for intervention.

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Author Affiliation: From Health Services Research and Evaluation Branch, Immunization Services Division, National Immunization Program, US Centers for Disease Control and Prevention, Atlanta, Ga (CAW); Kaiser Permanente, Cascade Medical Office, Atlanta, Ga (ADM); and Kaiser Permanente, Prevention and Health Promotion, Atlanta, Ga (KAL).

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Address correspondence to: Dr Carla A. Winston, Division of Tuberculosis Elimination, US Centers for Disease Control and Prevention, 1600 Clifton Rd, MS E-10, Atlanta, GA 30333; E-mail: cwinston@cdc.gov.

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